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Final Technical Report: NAG 5-2742 Vela-like Pulsars: A Bridge Between
Young and Old

This grant was in support of a guest observation using the ASCA satellite of the young, spin-powered pulsar PSR B1706-44. The pulsar is interesting for several reasons: 1) it is young and shares many similar characteristics with the Vela pulsar, 2) it is one of a few pulsars which has been detected by the EGRET detector aboard the CGRO satellite, and 3) it is one of the confirmed sources of TeV gamma-rays discovered with ground based telescopes. The goals of the observation were to search for pulsations in the X-ray domain and to study the near stellar environment to determine if the pulsar is embedded within a compact nebula as in the case of the Vela pulsar.

PSR B1706-44 was detected at roughly the level predicted based on observations at other wavebands. The observation was complicated, however, by the presence of an X-ray binary, 4U 1705-44, some 40 arcminutes off-axis which increased the background across the detector above what was anticipated. The imaging analysis involving ASCA was spearheaded by my Japanese collaborators in this effort, predominately Masaharu Hiriya and Saito Yoshitaka. The results of the imaging analysis and spectral analysis were combined with an observation utilizing the ROSAT High Resolution Imager and the final paper reporting that work is currently in press at the Astrophysical Journal ("A Broadband X-ray Study of the Young Neutron Star PSR B1706-44", by Finley, Srinivasan, Saito et al. 1997). The results of the analysis demonstrate that PSR B1706-44 is embedded within a compact nebula like the Vela pulsar and the results indicate that the TeV emission likely arises from inverse compton scattering of IR photons by the population of electrons which are producing the soft X-rays via the synchrotron mechanism.

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